

## CLAIMS

What is claimed is:

1. A metal valve stem sealing system comprising:  
a valve body;  
5 a metal valve stem housed within the valve body;  
a bonnet member housed within the valve body;  
a U-shaped metal stem gasket positioned between the metal valve stem and the bonnet member, wherein the gasket has a first lip member and a second lip member each having an interior surface and an exterior surface;  
10 a metal wedge ring fitted between the interior surface of the first lip member and the interior surface of the second lip member; and,  
at least one metal energizing spring adjacent the wedge ring, wherein the metal energizing spring applies a sufficient force to the wedge ring to cause the wedge ring to apply a sufficient contact pressure to the first and second lip  
15 members to expand the first and second lip members to form a seal between the gasket and the metal valve stem and to form a seal between the gasket and the bonnet member.
2. The metal valve stem sealing system of claim 2 further comprising  
20 an anti-rotation pin attached to the metal stem gasket.
3. The sealing system of claim 1 wherein the first lip member is coated on an exterior surface with an alloy selected from the group of alloys comprising tungsten carbides and chromium carbides.

4. The sealing system of claim 1 wherein the valve stem is coated on an exterior surface with an alloy selected from the group of alloys comprising tungsten carbides and chromium carbides.

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5. The sealing system of claim 1 wherein the first and second lip members have upper portions and lower portions, and wherein the lower portions are flexible and have exterior sloped surfaces adapted to ensure that when the contact pressure by the wedge ring against the lip members is applied, the lower portions of the first and second lip members rotate outwardly to increase the seal.

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6. The sealing system of claim 1 wherein the contact pressure is proportional to an operating pressure applied to the interior of the gasket.

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7. The sealing system of claim 1 wherein the wedge ring is comprised of a metal selected from the group consisting of high nickel alloy, Duplex SS, Super Duplex SS, and Inconel 718.

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8. The sealing system of claim 1 wherein the metal of the energizing spring is comprised of a metal selected from the group consisting of Inconel X750, Inconel 718, and Elgiloy.

9. The sealing system of claim 1 having from about one to about twenty energizing springs.

10.           The sealing system of claim 1 wherein the sealing system is used in deep sea gas and oil drilling, subsea flow lines and pipelines.
- 5           11.           The sealing system of claim 1 wherein the force applied by the energizing spring to the wedge ring is in the range of from about 100 pounds to about 2000 pounds.
- 10           12.           The sealing system of claim 1 wherein the gasket and lip members can withstand an operating pressure of up to 20,000 psi (pounds per square inch).
13.           The sealing system of claim 1 wherein the valve stem is a rotating stem.
- 15           14.           The sealing system of claim 1 wherein the valve stem is a rising stem.
- 20           15.           The sealing system of claim 1 further comprising a stem bearing adjacent a first top portion of the gasket; an energizing spring and spring holder both adjacent a second top portion of the gasket; and a thrust bearing adjacent a lower end of the energizing spring.

16. A metal valve stem sealing system comprising:
- a valve body;
  - a movable metal valve stem extending through a stem opening within the valve body;
  - 5 a bonnet member housed within the valve body;
  - a U-shaped metal stem gasket positioned between an exterior surface of the metal valve stem and an exterior surface of the bonnet member, wherein the gasket has a first lip member and a second lip member that both extend downwardly from a gasket body, the first and second lip members each having an
  - 10 interior surface and an exterior surface;
  - a metal wedge ring fitted into position between the interior surface of the first lip member and the interior surface of the second lip member; and,
  - at least one metal energizing spring positioned adjacent a bottom portion of the wedge ring, wherein the metal energizing spring applies a sufficient
  - 15 force to the wedge ring to cause the wedge ring to apply a sufficient contact pressure to the first and second lip members, such that the first lip member is mechanically forced to form a first airtight seal contact area between the first lip member and the exterior surface of the metal valve stem, and such that the second lip member is mechanically forced to form a second airtight seal contact area
  - 20 between the second lip member and the exterior surface of the bonnet member.
17. The sealing system of claim 16 further comprising an anti-rotation pin attached to the metal stem gasket.

18. A metal-to-metal seal for sealing between a movable valve stem and a bonnet member, the metal seal comprising:

a U-shaped metal stem gasket positioned between an exterior surface of the metal valve stem and an exterior surface of the bonnet member, wherein the gasket has a first flexible lip member and a second flexible lip member, the first and second lip members each having an interior surface, an exterior surface, an upper portion, and a lower portion, and further wherein the lower portion of each lip member has an exterior sloped surface;

a metal wedge ring positioned between the interior surface of the first lip member and the interior surface of the second lip member; and,

at least one metal energizing spring positioned adjacent the wedge ring, wherein the metal energizing spring applies a sufficient force to the wedge ring which causes the wedge ring to apply a sufficient contact pressure to the first and second lip members that mechanically forces the lower portions of the first and second lip members to rotate outwardly to form, respectively, a first airtight seal contact area between the first lip member and the exterior surface of the metal valve stem and a second airtight seal contact area between the second lip member and the exterior surface of the bonnet member.

19. The metal-to-metal seal of claim 18 wherein the gasket and lip members can withstand an operating pressure of up to 20,000 psi (pounds per square inch).

20. The metal-to-metal seal of claim 18 further comprising an anti-rotation pin attached to the metal stem.